(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
1 March 2007 (01.03.2007)

PCT

(10) International Publication Number
WO 2007/024143 A2

(51) International Patent Classification:
A01M 23/24 (2006.01)

(21) International Application Number:
PCT/NZ2006/000209

(22) International Filing Date: 18 August 2006 (18.08.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
539551 20 August 2005 (20.08.2005) NZ

(71) Applicant *(for all designated States except US)*: **ELECTROPAR LIMITED** [NZ/NZ]; 35 Lady Ruby Drive, East Tamaki, Auckland (NZ).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **SPICER, Craig, Dolan** [NZ/NZ]; 125 Stapelford Crescent, Browns Bay, Auckland (NZ). **TREMAIN, Murray, Carl** [NZ/NZ]; 2 Crossland Place, Maraetai, Auckland (NZ).

(74) Agent: **BUCHANAN, Elspeth, Victoria**; 61 Cambridge Terrace, (P.O. Box 1250), Christchurch (NZ).

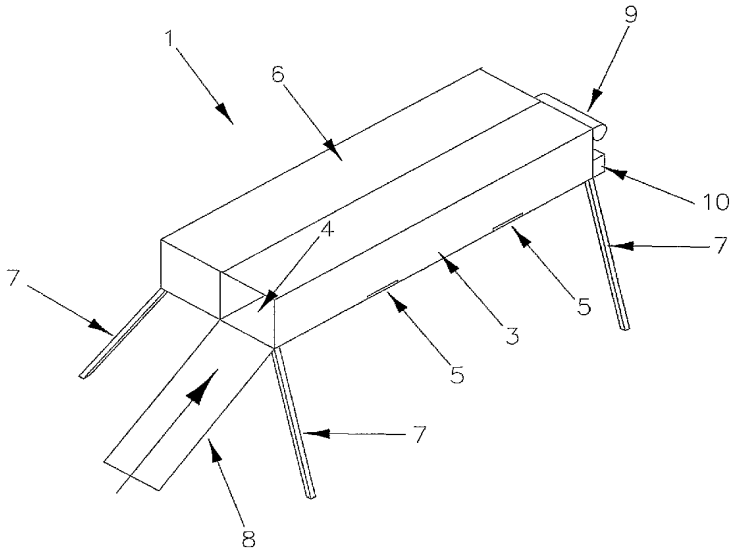
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: RODENT TRAP



(57) Abstract: An animal trap which includes: - a floor plate; - at least three electrodes which are spaced from each other physically and insulated from each other electrically; - a cover for the floor plate such that the floor plate and the cover together form an enclosure; - means to attract an animal onto the floor plate within the enclosure; - means to rotate the floor plate relative to the cover; - means for sensing the presence of an animal within the enclosure and in contact with a selected electrode; - means for applying an electrical potential difference of sufficient strength to kill the animal, between said selected electrode and the electrode furthest from said selected electrode, and for simultaneously applying an electrical potential difference between said selected electrode and the or an other electrode, when said sensing means senses an animal in contact with said selected electrode.

WO 2007/024143 A2

RODENT TRAP

Technical Field

This invention is a trap for attracting small animals, such as rodents, trapping and killing them by electrocution.

Background Art

There are an enormous number of methods of trapping undesirable animals, and devices embodying these methods. Where it is necessary or desirable to install traps in remote areas, a trap must be capable of operating remotely and repeatedly, without human intervention, for extended periods of time.

One previous invention which partially addresses these issues is disclosed in New Zealand Patent No. 243915. This discloses a trap which includes two electrodes, one of which is at an angle relative to the other, through which an electric current is passed automatically a predetermined time after the animal contacts the second electrode, and describes means to remove the body of the trapped animal from the trap. However, there is no means to prevent the animal from backing out of the trap during the electrocution cycle, which can lead to decreased effectiveness of the trap, and inhumane suffering in the partially-electrocuted animals.

New Zealand Patent No. 250372 discloses an alternative trap in which a current is applied once a sensor detects that the animal is in contact with both electrodes, and includes means to restrain the animal in the enclosure during the electrocution period. The first platform, on which the first electrode is located, then rotates 90° to discharge the carcass before returning to its original position. The restraining means described in the specific embodiment are spikes, but the animal could become impaled on these spikes, therefore blocking the trap by preventing proper discharge of the carcass, and increasing the animal's suffering.

PCT publication WO 2004/030450 A2 describes a trap incorporating means for communicating with an external surveillance unit, so that the status of traps can be monitored without needing to physically check each trap. Electrocution is followed with automatic opening of a trapdoor to dispose of the carcass and transmission of a

surveillance signal to report the kill. The trapdoor is described as bearing two or three electrodes, and the generation of a high voltage (500 V-4 kV) between a single pair of the electrodes is controlled by a microprocessor. Although three electrodes may be provided, only two electrodes are disclosed as being active at any time. This means that if the rodent jumps and breaks the electrical connection, or is able to back off one electrode on to another, it can escape from the trap.

An object of the present invention is the provision of a trap which can be repeatedly used to trap and kill small animals without human intervention. It is also an object of the present invention to provide a trap which kills as humanely as possible. It is a further object of the present invention to overcome the problems discussed above in relation to the prior art.

Disclosure of Invention

An animal trap which includes:

- a floor plate;
- at least three electrodes which are spaced from each other physically and insulated from each other electrically;
- a cover for the floor plate such that the floor plate and the cover together form an enclosure;
- means to attract an animal onto the floor plate within the enclosure;
- means to rotate the floor plate relative to the cover;
- means for sensing the presence of an animal within the enclosure and in contact with a selected electrode;
- means for applying an electrical potential difference of sufficient strength to kill the animal, between said selected electrode and the electrode furthest from said selected electrode, and for simultaneously applying an electrical potential difference between said selected electrode and the or an other electrode, when said sensing means senses an animal in contact with said selected electrode.

Preferably the electric potentials are applied as a pulsed waveform voltage ranging from 2.8-4.0 kilovolts (kV) at 250 Hertz (Hz) between the floor plate and the electrodes.

In a first embodiment of the invention, the floor plate is made from an electrically conductive material and forms one of said at least three electrodes, and the remaining electrodes are mounted upon the floor plate upon an insulating pad.

In another embodiment of the invention, the floor plate is made from an electrically insulating material and carries said at least three electrodes mounted on the surface of the floor plate and spaced apart along the length of the floor plate.

Preferably, the selected electrode and said other electrode are electrically connected by a Zener diode.

Preferably also, the means to rotate the floor plate is a servo motor, and the floor plate rotates relative to the cover about hinges located on one side of the floor plate.

Brief Description of Drawings

By way of example only a preferred embodiment of the present invention will be described in detail with reference to trapping a rat and to the accompanying drawings, in which:

Figure 1 is a perspective view of the trap;
Figure 2 is a plan view of the floor plate in a first embodiment of the invention;
Figure 3 is a plan view of the floor plate in the second embodiment of the invention; and
Figure 4 is a flow chart of the kill cycle.

Best Modes for Carrying Out the Invention

Referring to Figure 1 and Figure 2, the body of a trap 1 is comprised of an electrically conductive rectangular floor plate 11 and a three-sided cover 3. Three-sided cover 3 is shaped and dimensioned such that when three-sided cover 3 is placed over rectangular floor plate 11 the two pieces form a tunnel 4 with a rectangular cross-section. Floor plate 11 is rotatably attached to three-sided cover 3 by means of hinges 5.

Adjacent to tunnel 4 is a insulating case 6 containing electronic apparatus (not shown), including electronic controls and a power source, which is preferably a battery comprised of 4 AA cells connected in series. The tunnel 4 and insulating case 6 are elevated by means of legs 7.

At a first end 4a of the tunnel 4 is a ramp 8 leading from ground level to the first end 4a of the tunnel 4. At a second end 4b of the tunnel 4 is a bait station 9. The bait station 9 contains a bait substance (not shown), which has a fragrance that is attractive to the animal to be trapped, e.g. peanut butter makes a good bait for rats. The bait station 9 contains perforations (not shown) which allow the fragrance of the bait substance to escape.

At the second end 4b of the tunnel 4 is a servo motor 10, which is attached to floor plate 2 so that the servo motor 10 controls the motion of floor plate 11 about hinges 5. Servo motor 10 is electrically connected to the electronic apparatus in the insulating case 6.

An electrically insulating pad 12 is mounted on electrically conductive floor plate 11, which forms a first electrode. A second electrode 14 and a third electrode 13 mounted on the electrically insulating pad 12 so that the electrodes 11, 14 and 13 electrically insulated from each other. Additional electrodes may also be placed on the electrically insulating pad 12.

The electrodes 11, 14 and 13 all electrically connected to the electronic apparatus in insulating case 6. By operation of the electronic apparatus, the first electrode 11 can be electrically connected to, and at a different potential to, the third electrode 13. Likewise, the first electrode 11 can be electrically connected to and at a different potential to the second electrode 14 and to any of the additional electrodes referred to above. Preferably, this is achieved by electrically connecting the electrode 14 to the electrode 13 via a Zener diode, which allows a current to flow from the electrode 13 to the electrode 14 and back to the electronic apparatus, but not the other way.

A sensor 17 is located adjacent the third electrode 13, such that the sensor 17 is triggered when the front of an animal entering the trap reaches the third electrode 13, to start the kill cycle.

The sensor 17 may be of any suitable type. Alternatively, a sensor can be created by arranging the control apparatus to sense the resistance between the electrodes 11 and 13:- when an animal contacts both the electrodes 11 and 13, the resistance between the electrodes changes sharply, and this change can act as a sensor and trigger the start of the kill cycle.

In operation, the fragrance of the bait substance in bait station 9 attracts an animal (e.g. a rat, not shown). The rat ascends ramp 8 and enters the tunnel 4 by first end 4a as shown by the double headed arrows. When the rat passes over the electrode 14 and places its front paws on electrode 13, while its rear paws remain on electrically conductive floor plate 11 the sensor is triggered and the electrical circuit is closed. The sensor may be the sensor 17 shown, or the sensing of the change in resistance between the electrodes, as described above. The electronic apparatus commences a pre-programmed "kill cycle" and passes a pulsed waveform voltage ranging from 2.8-4.0 kilovolts (kV) at 250 Hertz (Hz) between electrode 13 and electrode 11. Current also can flow from electrode 13 to electrode 14, bringing electrode 14 to the same potential as electrode 13.

Thus, if the rat backs off electrode 13 on to electrode 14, it still experiences the electric potential difference between electrode 11 and electrode 14. Because electrode 11 completely surrounds the electrically insulating pad 12 on which the electrodes are situated, whether the rat attempts to jump, back off the plate, move forward off the plate or turn around, it will still be forced into contact with floor plate 11 and one of electrodes 13 or 14. This ensures that electrocution of the rat is quick and complete, and that the rat does not escape from the trap after only partial electrocution.

The length of the kill cycle is pre-programmed to be sufficiently long to ensure death in the rat. At the end of the kill cycle, the electronic apparatus signals the servo motor 10. Floor plate 2 rotates about hinges 5 so that the carcass of the rat can drop from the floor plate 11 to the ground below. Servo motor 10 then rotates the floor plate 11 back to its original position and the trap is reset and ready for the next rat.

Referring to Figure 3, in a second embodiment of the present invention, the trap is constructed in the same manner as described with reference to Figures 1 and 2, except that the arrangement of the floor plate 11 and the electrodes is different:- the floor plate 11 is made of an electrically insulating material, and carries three spaced

electrodes 24, 25 and 26.

The floor plate 11 may be made of any suitable robust insulating material. The electrodes 24, 25 and 26 extend across the full width of the floor plate 11 and are spaced apart along the length of the floor plate, so that there are portions of insulating material between the electrodes. As with the first embodiment, the floor plate 11 is hinged to the cover 3 by means of hinges 5, and an animal entering the trap enters at the first end 4a.

Each of the electrodes 24, 25, 26 is electrically connected to the electronic controls in insulating case 6. The electrical connections are such that a potential difference may be applied between the first and third electrodes 24, 26. The third electrode 26 is connected to the second electrode 25 via a Zener diode, so that when a potential difference is applied between the electrodes 24 and 26, the same potential difference is applied between the electrodes 25 and 26.

A sensor 27 is mounted adjacent the third electrode 26, such that the sensor 27 is triggered when the front of an animal which has entered the trap (moving in the direction of the double headed arrow from end 4a to end 4b) reaches the third electrode 26. However, as with the first embodiment, the sensor 27 may be replaced by sensing the change in resistance between the electrodes 24 and 26 when the rat contacts both electrodes.

As shown in Figure 4, the sequence of events in the killing cycle is as follows:- the animal enters the trap at end 4a and moves towards the bait in the bait station 9. At this stage, all three electrodes 24, 25 and 26 are unpowered; it is not until the front of the animal triggers the sensor 27 (or the change in resistance is sensed) that the sensor activates the electronic controls so that a potential difference is applied between electrodes 26 and 24, and between electrode 26 and 25. The potential difference applied is as described with reference to the first embodiment. The length of the tunnel 4 is such that when the animal has its front feet on the electrode 26, it normally would have its back feet on the electrode 24.

The above method ensures that the animal is fully within the trap before any electrical current is applied, so that the animal cannot jump backwards from the trap and escape. Further, the fact that the same potential difference is applied between the

plates 25 and 26 as between the plates 24 and 26 means that the animal still is killed efficiently even if it backs away from the electrode 26.

At the end of the kill cycle, the animal's body is ejected from the trap by pivoting the floor plate 11 as described with reference to the first embodiment.

One or more further electrodes may be added to the floor plate 11 between the third electrode 26 and the bait station 9; any such further electrodes would be electrically connected so as to be at the electrical potential of the electrode 24 during the kill cycle.

One or more of the electrodes 25, 26, or additional electrodes, could be shaped to contact the animal's head or chest, as appropriate.

The invention as described is a self-emptying trap which can operate for multiple cycles without requiring human intervention. Because only the fragrance of the bait substance attracts the rat, there is minimal loss of bait over time.

The electrocution provided by the invention has been independently tested and approved as meeting the guidelines for humane killing set down by the National Animal Welfare Advisory Committee of New Zealand.

Claims:

1. An animal trap which includes:
- a floor plate;
- at least three electrodes which are spaced from each other physically and insulated from each other electrically;
- a cover for the floor plate such that the floor plate and the cover together form an enclosure;
- means to attract an animal onto the floor plate within the enclosure;
- means to rotate the floor plate relative to the cover;
- means for sensing the presence of an animal within the enclosure and in contact with a selected electrode;
- means for applying an electrical potential difference of sufficient strength to kill the animal, between said selected electrode and the electrode furthest from said selected electrode, and for simultaneously applying an electrical potential difference between said selected electrode and the or an other electrode, when said sensing means senses an animal in contact with said selected electrode.

2. The animal trap as claimed in claim 1, wherein the floor plate is made from an electrically conductive material and forms one of said at least three electrodes, and the remaining electrodes are mounted upon the floor plate upon an insulating pad.

3. The animal trap as claimed in claim 2, wherein said sensing means in use senses an animal in contact with the floor plate and with said selected electrode, and said selected electrode is the electrode closest to the means to attract an animal onto the floor plate.

4. The animal trap as claimed in claim 1, wherein the floor plate is made from an electrically insulating material and carries said at least three electrodes mounted on the surface of the floor plate and spaced apart along the length of the floor plate.

5. The animal trap as claimed in claim 4, wherein said selected electrode is the electrode closest to the means to attract an animal onto the floor plate.

6. The animal trap as claimed in any one of the preceding claims, wherein the selected electrode and said other electrode are electrically connected via a Zener diode.

7. The animal trap as claimed in any one of the preceding claims, wherein the means to rotate the floor plate is a servo motor.

8. The animal trap as claimed in any one of the preceding claims, wherein the floor plate rotates relative to the cover about hinges located on one side of the floor plate.

9. The animal trap as claimed in any one of the preceding claims, wherein said electrodes are flat plates.

10. The animal trap as claimed in any one of claims 1 - 8, wherein at least one of said electrodes is shaped to contact the head or chest of an animal to be killed by the trap.

11. The animal trap as claimed in any one of the preceding claims, wherein the means for sensing the presence of an animal within the trap comprises a sensor adjacent said selected electrode.

12. The animal trap as claimed in any one of claims 1 – 10, wherein the means for sensing the presence of an animal within the trap comprises means for sensing the change in electrical resistance between said selected electrode and said electrode furthest from said selected electrode when an animal is in contact with both said electrodes.

13. The animal trap as claimed in any one of the preceding claims, wherein the means for applying an electrical potential difference includes means for applying a pulsed waveform voltage in the range 2.8 - 4 .0 kV at 250 Hertz.

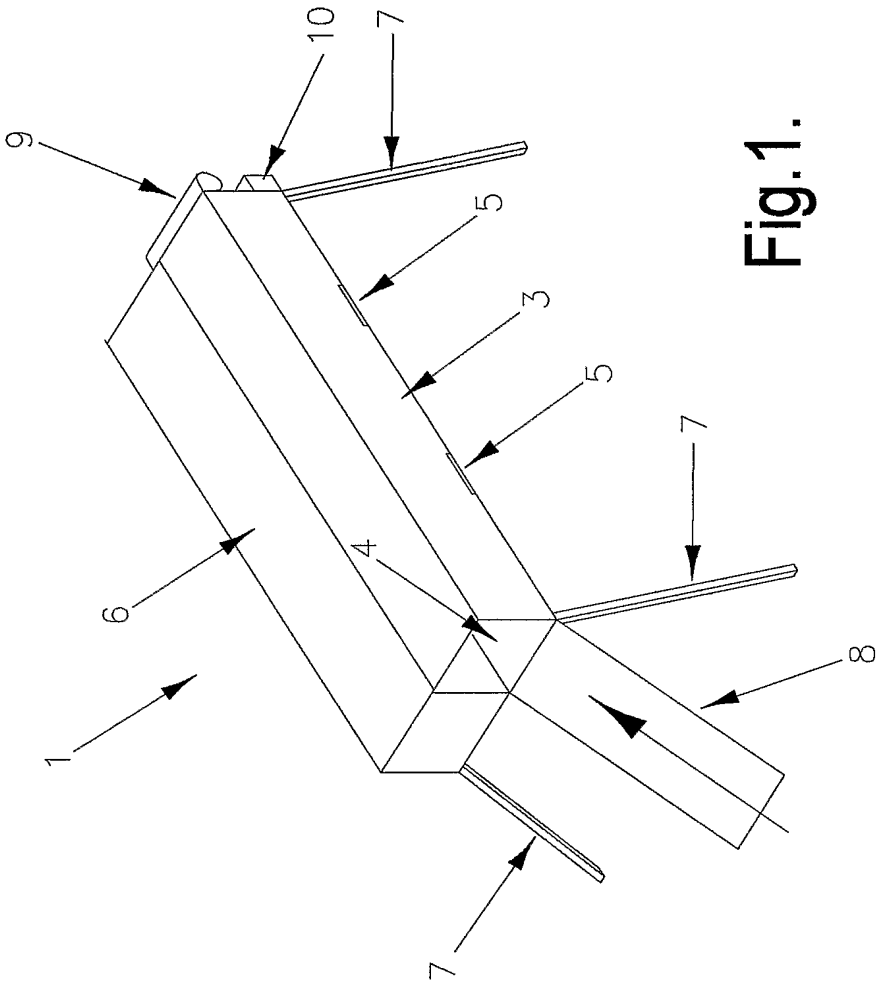


Fig.1.

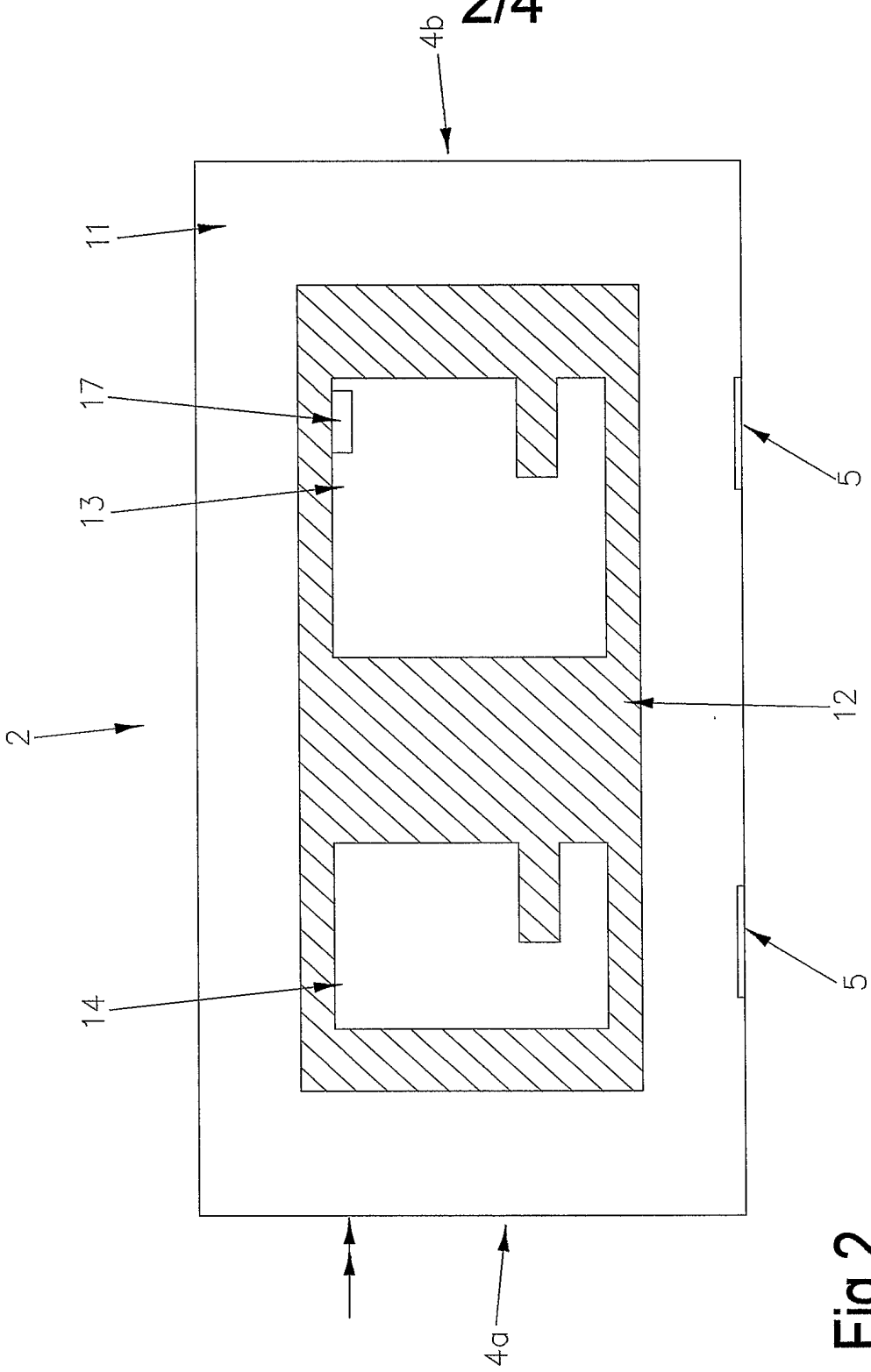


Fig.2.

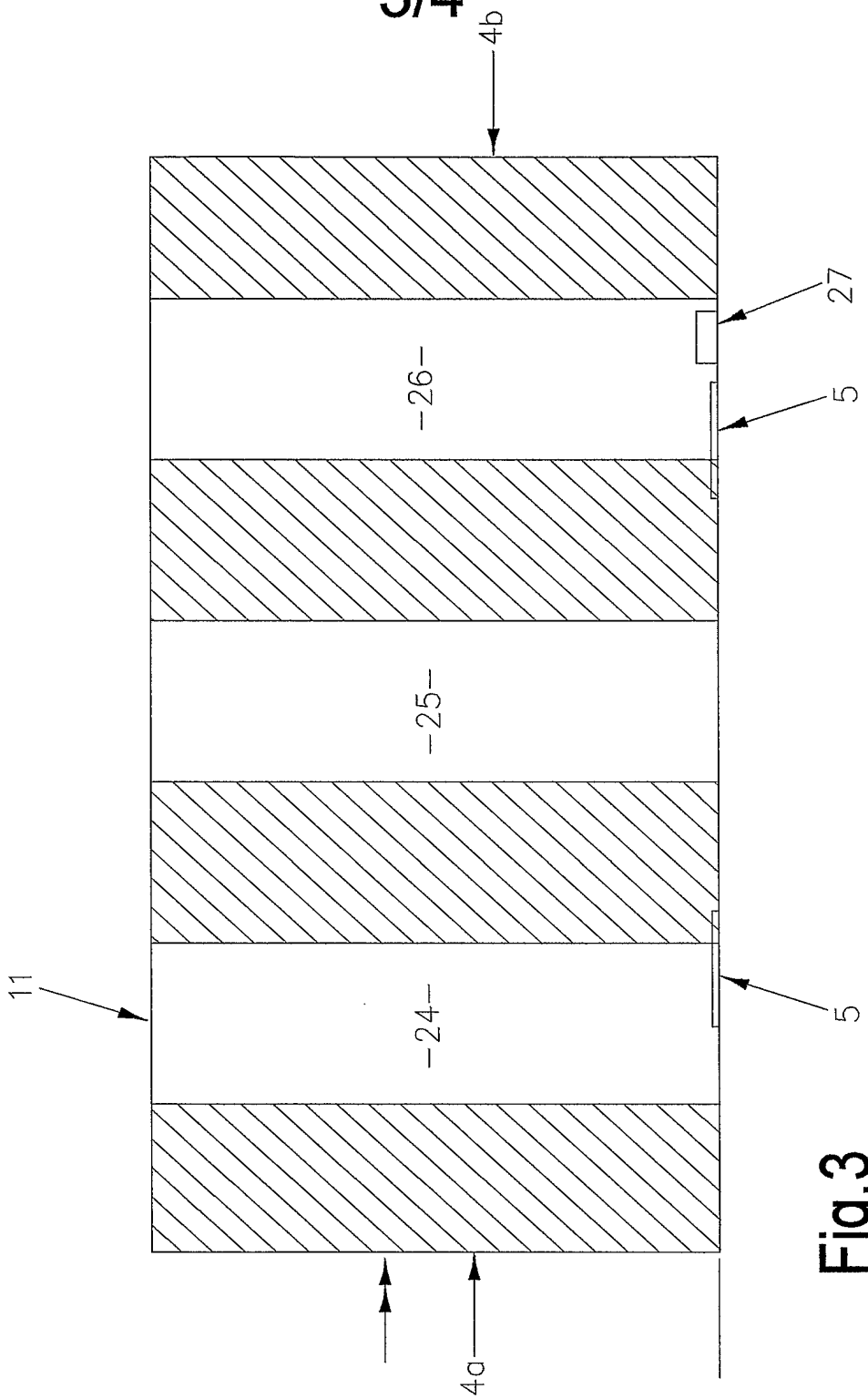


Fig.3

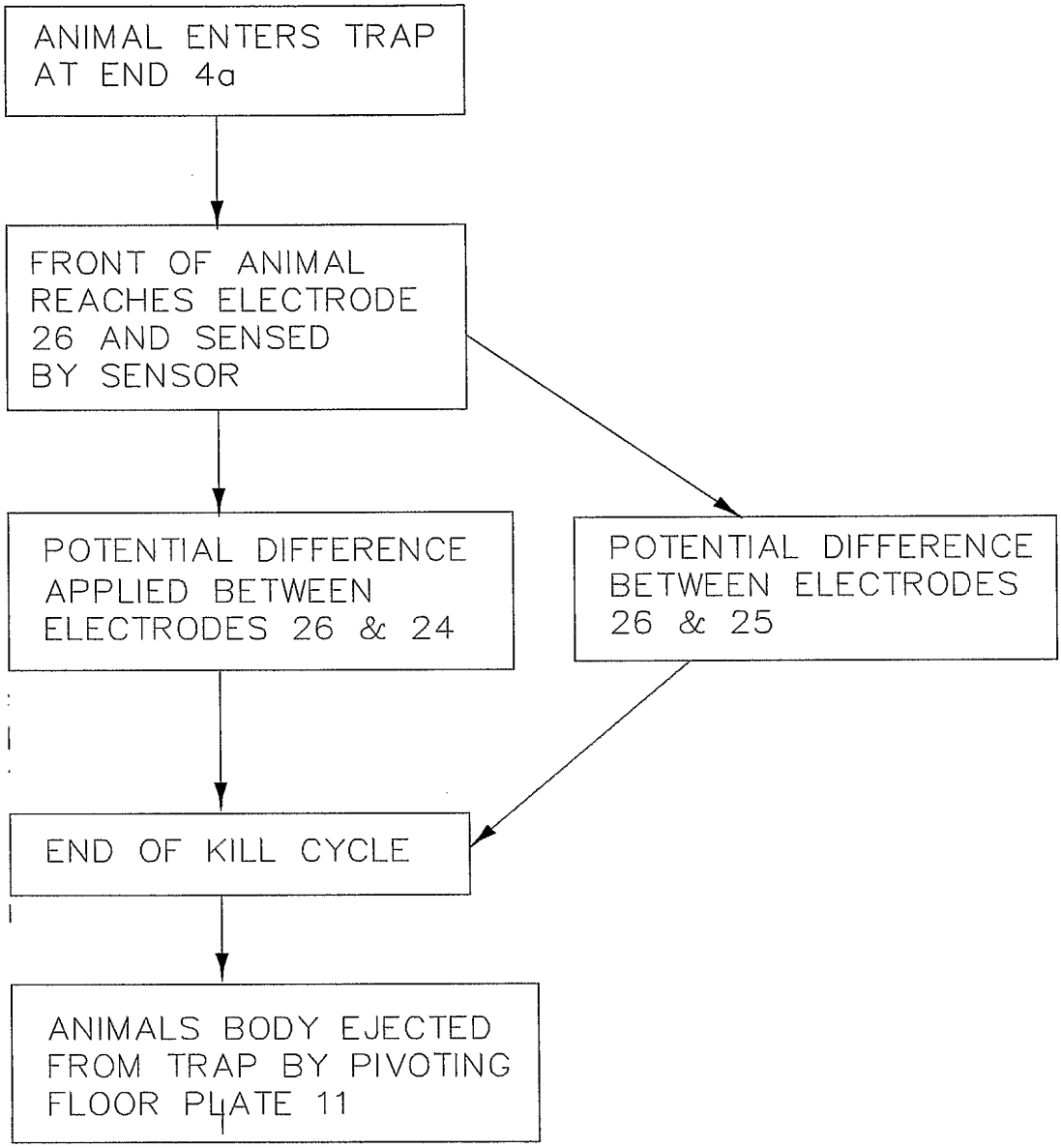

ANIMAL ENTERS TRAP AT END 4a
FRONT OF ANIMAL REACHES ELECTRODE 26 AND SENSED BY SENSOR
POTENTIAL DIFFERENCE APPLIED BETWEEN ELECTRODES 26 & 24
POTENTIAL DIFFERENCE BETWEEN ELECTRODES 26 & 25
END OF KILL CYCLE
ANIMALS BODY EJECTED FROM TRAP BY PIVOTING FLOOR PLATE 11

Fig.4

PUB-NO: WO2007024143A2

DOCUMENT-IDENTIFIER: WO 2007024143 A2

TITLE: RODENT TRAP

PUBN-DATE: March 1, 2007

INVENTOR-INFORMATION:

NAME	COUNTRY
SPICER, CRAIG DOLAN	NZ
TREMAIN, MURRAY CARL	NZ

ASSIGNEE-INFORMATION:

NAME	COUNTRY
ELECTROPAR LTD	NZ
SPICER CRAIG DOLAN	NZ
TREMAIN MURRAY CARL	NZ

APPL-NO: NZ2006000209

APPL-DATE: August 18, 2006

PRIORITY-DATA: NZ53955105A (August 20, 2005)

INT-CL (IPC): A01M023/38

EUR-CL (EPC): A01M023/38 , A01M031/00

ABSTRACT:

CHG DATE=20071109 STATUS=O>An animal trap which includes: - a floor plate; - at least three

electrodes which are spaced from each other physically and insulated from each other electrically; - a cover for the floor plate such that the floor plate and the cover together form an enclosure; - means to attract an animal onto the floor plate within the enclosure; - means to rotate the floor plate relative to the cover; - means for sensing the presence of an animal within the enclosure and in contact with a selected electrode; - means for applying an electrical potential difference of sufficient strength to kill the animal, between said selected electrode and the electrode furthest from said selected electrode, and for simultaneously applying an electrical potential difference between said selected electrode and the or an other electrode, when said sensing means senses an animal in contact with said selected electrode.